

PROMPT REPORT FOR BNL LHC DIPOLE D1L105.

P. Wanderer. August 3, 2002

Magnet Construction.

Memo from John Cozzolino to Peter Wanderer, August 5, 2002.

The final documentation summary for this magnet includes the Master Discrepancy Report (DR) List and Master Deviation Waiver Request (DWR) List shown below. All deviations and discrepancies have been thoroughly reviewed, dispositioned, and approved by the Cognizant Engineer and the LHC Project Engineer.

The most significant difficulties encountered during the fabrication of this magnet occurred during coil fabrication and collaring. These problems are documented in DR #4-105 and DR #4-106.

During either the winding or the curing operations, the insulation on the ID of coil DCL2013 was damaged as noted in DR #4-105. This was noticed during a routine coil inspection by the technician. The damaged insulation could have resulted later in a turn-to-turn or turn-to-ground short, had it not been found. The cause was traced to a metal burr on the winding mandrel, which was subsequently removed.

A hypot failure occurred between upper coil DCL-2006 and the quench protection strip heaters, as documented in DR #4-106. After uncollaring the coil, an inspection showed the location of the short, but the cause was not immediately apparent. However, further investigation revealed small metal chips in the yoke lamination modules. It is surmised that a chip became lodged between the coil OD and the strip heater. The hypot failure was probably exacerbated by the large diameter beam tube in D1 magnets, which results in minimal clearance to the ID of the coil and may increase the radial pressure (the tube diameter is a machine aperture requirement dictated by CERN). The discovery of these chips required BNL technicians to individually inspect and clean each pinned yoke module before installation for the remainder of the D1 program. The tooling was checked thoroughly for remaining chips, and the overall cleanliness of the collaring operation and the surrounding area was improved. The insulation between the coil and the strip heater was improved by adding 0.05mm (0.002 in.) additional kapton to the coil OD at each quadrant.

Finally, the positions of some of the magnet's pipe ends did not fall within the specified tolerances, as documented in DR #R-1082. The pipe positions were brought into compliance by adding small mitered offsets, or, in cases where appropriate, slight bends were introduced.

Magnet Testing.

QUENCH TEST CONDITIONS FOR D1L105 (FIRST PRODUCTION LHC D1 DIPOLE) IN HORIZONTAL TEST BAY E – by J. Muratore

D1 magnets have, by design, a more restricted space between the magnet cold bore tube and the ID of the magnet coils than the RHIC arc dipoles. This reduces the flow of the helium to cool the conductor, especially after a quench or the introduction of heat leaks from the outside such as that from the warm bore tube. Consequently the initial quench performance of the magnet was lowered

than expected. Various measures to reduce the heat leaks were performed until proper quench performance was achieved.

Quenches 1-10: Warm bore tube installed, sealed, and under vacuum.

Quenches 11-14: After thermal cycle - insulation added to end can; copper braid attached from warm bore tube to helium line as heat sink

Warm bore tube sealed, with quench antenna installed.

Quenches 15-16: After overnight cooling, system temperatures decreased.

Quenches 17-19: Warm bore tube open, quench antenna still in place.

Quench 20: After overnight cooling, system temperatures decreased

Quenches 21-24: After thermal cycle - warm bore tube removed, cryostat flanges sealed; no quench antenna. Magnet trained properly to conductor limit.

Field Quality.

Only warm measurements were made, but the warm and cold data from another magnet were available at the time of the meeting. With minor exceptions, the field quality was within the range of expected values. The exceptions were judged to be of small consequence. (Details of the AP review of the FQ data are given in the minutes of the acceptance meeting.)

Master DWR List for: DML105/D1L105/DCL2006/DCL2013

<i>Serial Number</i>	<i>DWR No.</i>	<i>Date</i>	<i>Drawing</i>	<i>Description</i>	<i>Status</i>
<i>D1L105</i>					
	M 0253	9/10/01	14060030+	NAMEPLAT INSTALLATION REVISED.	A
	M 0262	2/26/02	14060005	WELD NOT PRESSURE /LEAK CHECKED	A
	M 0265	3/20/02	LHC-MAG-R-1048	NO WITNESS ON PRESSURE CHECK.	A
	M 0266	3/21/02	LHC-MAG-R-1041	SENSOR CHECK ANOMALIES	A
ELECTRICAL	M 0267 A	3/26/02	MDC 744	OPEN ITEMS FROM CHECKS	
	M 0272	4/22/02	14060005	SENSOR ANOMALIES	-
	M 0273	5/8/02	14060005	PIPES OUT OF POSITION	-
	M 0274	7/17/02	14060005	BEAM SCREEN OUT OF TOLERANCE	-
<i>DML105</i>					
	M 0260	2/15/02	14010371	PARTS REQUIRED REPAIR	A
	M 0263	3/13/02	LHC-MAG-R-1035	DIFFERENT MEASUREMENT METHOD USED.	A
	M 0264	3/14/02	LHC-MAG-R-1041	NO WITNESS ON PRESSURE LEAK CHECK	A

Master DR List for: DML105/D1L105/DCL2006/DCL2013

<i>Serial Number</i>	<i>DR Number</i>	<i>Description</i>	<i>Status</i>	<i>Disposition</i>	<i>Written</i>	<i>Closed</i>
<i>D1L105</i>						
	R-1082	SEVERAL OUT-OF-TOLERANCE PIPE POSITIONS	F	RPR	4/25/02	5/22/02
<i>DCL2013</i>						
	4-0105	INSULATION DAMAGE TO TURNS 10 + 11 ON THE RIGHT SIDE, 41" FROM THE LEAD END STRAIGHT SECTION	F	RPR	2/16/01	3/19/01
<i>DML105</i>						
	4-0106	UPPER COIL # DCL2006 FAILED HYPOT @ 5KV TO UPPER RIGHT SIDE QUENCH PROTECTION RESISTOR	F	RPR	2/23/01	4/1/01